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CONTRIBUTION THE OF MIRZO ULUGH BEG TO ASTRONOMY AND ITS SIGNIFICANCE IN MODERN SCIENCE

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Abstract: This article is devoted to the scientific activity of the great scholar and statesman Mirzo Ulug‘bek. It analyzes his contributions to the field of astronomy, with particular emphasis on the activities of the Samarkand Observatory and the scientific significance of his work Zij-i Sultani. Furthermore, the article provides insights into his scientific legacy and his role in the development of astronomy. In conclusion, it highlights the relevance and importance of Ulugh Beg’s scientific heritage in contemporary science.

Keywords: Mirzo Ulugh Beg, Ulugh Beg Observatory, Timurids, astronomy, mathematics, Zij-i Jadid-i Kuragoni, star catalogue, Samarkand

I. Introduction

The 15th century is considered one of the most significant periods in the history of Central Asia, characterized by remarkable advancements in science, culture, and intellectual life. During the Timurid era in particular, considerable attention was devoted to the promotion of knowledge, leading to the establishment of numerous madrasas, libraries, and scientific institutions. As a result, scholarly research flourished, and disciplines such as mathematics, astronomy, philosophy, and others experienced substantial progress.

One of the most outstanding scholars to emerge from this intellectually rich environment was Mirzo Ulug‘bek. He occupies a prominent place in the history of world science not only as a powerful statesman but also as a renowned astronomer and mathematician. Through his initiative, major scientific centers were established in Samarkand, where numerous scholars collaborated on advanced research.

Among these achievements, the construction of the Ulugh Beg Observatory stands out as one of the most remarkable. It was one of the largest and most advanced astronomical institutions of its time. Today, Ulugh Beg’s scientific legacy holds great importance not only in Uzbekistan but also in the global history of science. His astronomical studies have served as a crucial foundation for subsequent generations of scholars. Therefore, examining his contributions to astronomy and conducting an in-depth analysis of his scientific heritage remain highly relevant in the modern era.

II. Main Body

2.1 Ulugh Beg’s Scientific Activity

Mirzo Ulug‘bek (1394–1449) is recognized not only as a statesman but also as one of the most prominent astronomers and mathematicians of the medieval period. He was born in 1394 in the city of Sultaniyya. From an early age, Ulugh Beg demonstrated a profound interest in science, devoting himself to the in-depth study of mathematics, astronomy, and philosophy. Historical sources indicate that during his youth, he accompanied his grandfather, Amir Temur, on various

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journeys to different countries, where he became acquainted with renowned scholars and great libraries. These experiences further intensified his passion for scientific inquiry.

From 1409 onward, Ulugh Beg began ruling over Samarkand and the region of Transoxiana. Despite his responsibilities as a ruler, he consistently prioritized scholarly pursuits over political affairs. In particular, he actively supported scholars in the fields of mathematics and astronomy, creating favorable conditions for scientific research. In 1420, the Ulugh Beg Madrasa was established in Samarkand, soon becoming one of the most prestigious academic institutions of its time. There, subjects such as mathematics, astronomy, and philosophy were taught at an advanced level. The intellectual environment that developed around this madrasa later gave rise to what became known as the Ulugh Beg scientific school.

Ulugh Beg gathered around him a number of outstanding scholars. Among them, the distinguished mathematician and astronomer Ghiyath al-Din Jamshid Kashani and the prominent astronomer Ali Qushchi held a special place. For instance, al-Kashi achieved remarkable success in mathematics and is renowned for calculating the value of π (pi) with extraordinary precision. He actively participated in Ulugh Beg's scientific research.

Similarly, Ali Qushchi, one of Ulugh Beg's closest disciples, produced numerous scholarly works in astronomy and mathematics. Even after Ulugh Beg's death, he continued his teacher's scientific traditions and contributed significantly to the dissemination of this intellectual legacy across different regions. As a result of the research conducted under Ulugh Beg's leadership, Samarkand emerged as one of the most important scientific centers in the world during the 15th century.

2.2 The Samarkand Observatory and Scientific Research

In the 15th century, under the initiative of Mirzo Ulug'bek, one of the most advanced scientific institutions of its time—the Ulugh Beg Observatory—was constructed in the city of Samarkand. According to historical sources, the observatory was built between approximately 1424 and 1429. This scientific complex was specifically designed for conducting astronomical observations and became one of the most significant research centers in the medieval Islamic world.

The observatory was cylindrical in shape and stood at an approximate height of 30 meters. Its most important instrument was a massive sextant located within the structure. This device enabled astronomers to measure the altitude of celestial bodies and determine their movements with remarkable precision. The radius of the sextant was nearly 40 meters, making it an exceptionally large and highly accurate scientific instrument for its time.

2.2 The Samarkand Observatory and Scientific Research (continued)

As a result of the observations conducted at the Ulugh Beg Observatory, precise data on the movements of stars and planets were systematically collected. Throughout this process, numerous scholars actively participated, carrying out astronomical observations under the leadership of Mirzo Ulug'bek and achieving significant scientific results in determining the coordinates of celestial bodies.

Consequently, the research conducted at the observatory played a crucial role in the advancement of astronomy. The data gathered there later served as a foundational source for many subsequent scientific works in the field of astronomy.

2.3 Ulugh Beg's Contribution to Astronomy

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Mirzo Ulug‘bek occupies a distinguished place in the history of astronomy due to his remarkably precise observations and calculations. In the 15th century, the astronomical studies conducted under his leadership resulted in highly accurate data on the motion of celestial bodies. The most significant outcome of these studies was the creation of the renowned astronomical work Zij-i Jadid-i Kuragoni (also known as Zij-i Sultani).

Completed around 1437, this work is considered one of the most comprehensive scientific achievements of medieval astronomy. It contains the precise coordinates of 1,018 stars and is recognized as the most important star catalogue since the Almagest by the ancient Greek scholar Claudius Ptolemy.

Ulugh Beg and his scientific team also determined the length of the solar year based on their astronomical observations. According to their calculations, the solar year lasts 365 days, 6 hours, 10 minutes, and 8 seconds. Modern scientific measurements estimate it as 365 days, 6 hours, 9 minutes, and 9.6 seconds. Thus, Ulugh Beg’s result differs from the modern value by only a few seconds—an extraordinary level of accuracy for that era.

In addition, Ulugh Beg calculated the obliquity of the ecliptic as 23° 30′ 17″, whereas modern astronomy places it at approximately 23° 26′. This further demonstrates the exceptional precision of his observations. Under his leadership, detailed astronomical tables were compiled, including data on planetary motion, stellar positions, and time calculation. These tables were widely used by both Eastern and European scholars. In the 16th and 17th centuries, European astronomers also relied on Ulugh Beg’s star catalogue as an important scientific source.

In this way, the astronomical tables and observations produced by Ulugh Beg represent one of the most significant achievements of medieval astronomy. His scientific legacy holds an important place not only in Eastern scholarship but also in the global development of astronomical science.

2.4 The Significance of Ulugh Beg’s Scientific Legacy in Modern Science.

A significant role in preserving the legacy of the great scholar was played by his disciple, Ali Qushchi. By continuing Ulugh Beg’s scientific traditions, he made substantial contributions to the development of astronomy and mathematics. Ali Qushchi later pursued his academic career in other regions as well, which facilitated the wider dissemination of Ulugh Beg’s scientific heritage. As a result, Ulugh Beg’s research influenced not only the scholarly world of the East but also the scientific environment of Europe.

In the 16th and 17th centuries, European astronomers also made use of Ulugh Beg’s star catalogue and astronomical observations. For instance, data on stellar coordinates served as an essential scientific source for subsequent astronomical research. Therefore, Ulugh Beg’s works are regarded as a crucial stage in the history of world astronomy.

Even today, the scientific legacy of Mirzo Ulug‘bek remains highly significant. His contributions to astronomy are considered an important source for studying the history of science. Moreover, the remains of the Ulugh Beg Observatory in Samarkand continue to be studied as both a historical and scientific monument.

Ulugh Beg’s scientific activity also serves as a powerful inspiration for today’s youth. He is distinguished by his boundless curiosity, dedication to research, and strong support for scholars. For this reason, his legacy encourages younger generations to pursue knowledge, acquire new skills, and engage in scientific inquiry.

III. Conclusion

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Mirzo Ulug‘bek was not only a great statesman but also one of the most remarkable scholars who left an enduring mark on the history of human knowledge. The observations and research conducted at the Ulugh Beg Observatory, established under his initiative, elevated medieval astronomy to a new level. In particular, his renowned work Zij-i Jadid-i Kuragoni, with its detailed star catalogue and precise astronomical calculations, made a profound contribution to the advancement of global science.

Ulugh Beg’s deep passion for knowledge, his relentless pursuit of learning, and his efforts to promote scientific progress continue to serve as an inspiring example for younger generations. His rich scientific heritage encourages us to seek knowledge, engage in research, and contribute to the development of the future.

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